Installation Instructions

ControlLogix® 5560M03SE Combination Controller and SERCOS interface

Catalog Number: 1756-L60M03SE

Introduction

The ControlLogix®5560M03SE controller is a 2-slot ControlLogix controller that includes a 3-axis SERCOS interface™.

WARNING

An electrical arc can occur if you:

- insert or remove the controller while backplane power is on
- connect or disconnect the battery
- connect or disconnect the serial cable with power applied to this module or the serial device on the other end of the cable

This could cause an explosion in hazardous location installations. Make sure that power is removed or the area is nonhazardous before proceeding.

Publication 1756-IN593A-EN-P – June 2004

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of these products must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards. In no event will Rockwell Automation be responsible or liable for indirect or consequential damage resulting from the use or application of these products.

Any illustrations, charts, sample programs, and layout examples shown in this publication are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Rockwell Automation office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Reproduction of the contents of this copyrighted publication, in whole or part, without written permission of Rockwell Automation, is prohibited.

Throughout this publication, notes may be used to make you aware of safety considerations. The following annotations and their accompanying statements help you to identify a potential hazard, avoid a potential hazard, and recognize the consequences of a potential hazard:

WARNING

Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

ATTENTION

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

IMPORTANT

Identifies information that is critical for successful application and understanding of the product.

Related Documentation

The following documents contain additional information concerning related Allen-Bradley products.

For:	Read This Document:	Publication Number
Installing a battery module	*ControlLogix Battery Module Installation Instructions*	1756-IN576
Controller procedures	*Logix5000 Controllers Common Procedures*	1756-PM001
Controller commands	*Logix5000 Controllers General Instructions Reference Manual*	1756-RM003
System information	*ControlLogix System User Manual*	1756-UM001
ControlLogix motion commands	*Motion Instruction Set Reference Manual*	1756-RM007
Information on setup and configuration	*ControlLogix Motion Module Setup and Configuration manual*	1756-UM006
Installation, wiring, and setup for the 1394C-SJTxx-D	*1394 SERCOS Interface Multi Axis Motion Control System*	1394C-5.20
Information on integrating the 1394 drive with SERCOS	*1394 SERCOS Integration Manual*	1394-IN024
Ultra3000 installation	*Ultra3000 Hardware Installation Manual*	2098-IN003
Kinetix 6000 Module installation	*Kinetix 6000 Module Installation Manual*	2094-IN004
Kinetix 6000 installation	*Kinetix 6000 Installation Manual*	2094-IN001
Integrating the Kinetix 6000 with SERCOS	*Kinetix 6000 Integration Manual*	2094-IN002
Integrating the Ultra3000 with the 1756-MxxSE	*Ultra3000 SERCOS Integration Manual*	2098-IN005
8720MC High Performance Drive user information	*8720MC High Performance Drive User Manual*	8720MC-UM001

To obtain a copies of the above manuals:

If you want to:	Then:
view a manual	Visit either of these locations: • www.ab.com/manuals • www.theautomationbookstore.com
download a manual	
purchase a printed manual	Use one of these options: • contact your local distributor or Rockwell Automation representative • visit www.theautomationbookstore.com and place an order • call 800.963.9548 (USA/Canada) or 001.320.725.1574 (outside USA/Canada)

Overview

The ControlLogix5560M03SE controller serves as a link between the ControlLogix platform and intelligent drives. The communication link between the controller and the drive(s) is via IEC/EN 61491 SErial Real-time COmmunication System (SERCOS) using fiber optic medium. Fiber optics assures reliable high speed data transmission with excellent noise immunity, improved performance, and elimination of interconnect wiring.

SERCOS is a real-time optical serial interface between the controller and its associated drives to transmit periodic and non-periodic data. It uses a ring topology with one master and multiple slaves (axes). The 3 Axis SERCOS interface lets the controller control 1 to 3 axes in either position, velocity, or torque mode. It provides a cycle period of 0.5ms, 1ms, or 2ms depending on the number of axes. It provides a ring data rate of 4 Mbaud or 8 Mbaud. The device meets ASA System specifications.

How to Handle ControlLogix Components

ATTENTION

Preventing Electrostatic Discharge

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

Prepare the Chassis

Before you install the controller, do these preliminary steps:

☑ Install a ControlLogix chassis according to the *ControlLogix Chassis Installation Instructions*, publication 1756-IN080.

☑ Install a ControlLogix power supply according to the corresponding installation instructions:

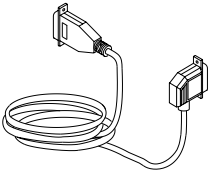
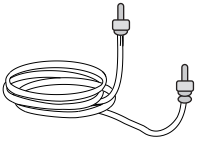
Install this power supply:	According to this publication:
1756-PA72	*ControlLogix Power Supplies Installation Instructions*, publication 1756-5.67
1756-PB72	
1756-PA75	*ControlLogix Power Supplies Installation Instructions*, publication 1756-5.78
1756-PB75	
1756-PA75R	• *ControlLogix Redundant Power Supplies Installation Instructions*, publication 1756-IN573 • *ControlLogix Redundant Power Supplies Chassis Adapter Module Installation Instructions*, publication 1756-IN574
1756-PB75R	

Make Sure that You Have All the Components

These components ship with the module:

Component:	Description:
	1756-BA1 battery
	key

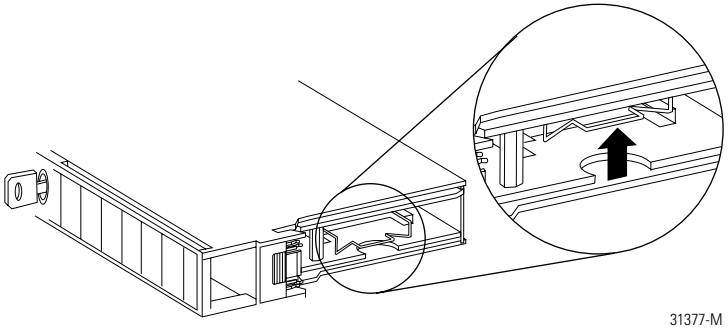
You may also use these components with the module:

And you want to:	**Then use this component:**
connect a device to the serial port of the controller (e.g., connect a computer to the controller)	1756-CP3 serial cable  42576
provide battery support for the controller longer than the time that is available with the 1756-BA1 battery	1756-BATM ControlLogix battery module 31298
add nonvolatile memory	1784-CF64 Industrial CompactFlash card 31376-M
connect the SERCOS interface to drives	Glass: 2090-SCVGx-x Plastic: 2090-SCxPx-x 

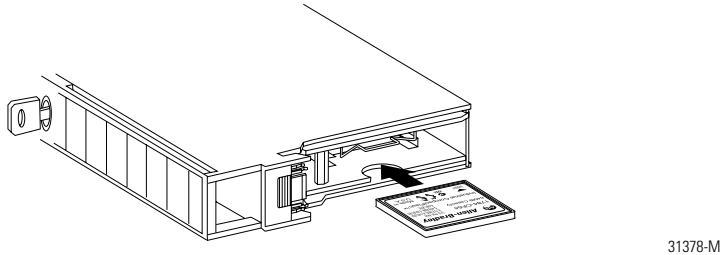
Install a 1784-CF64 Industrial CompactFlash Card in the Controller

A 1784-CF64 Industrial CompactFlash card provides nonvolatile memory for the controller. If you are using a CompactFlash card, install the card as follows:

1. Lay the controller on its side with the front facing to the left.
2. Raise the locking clip all the way up.



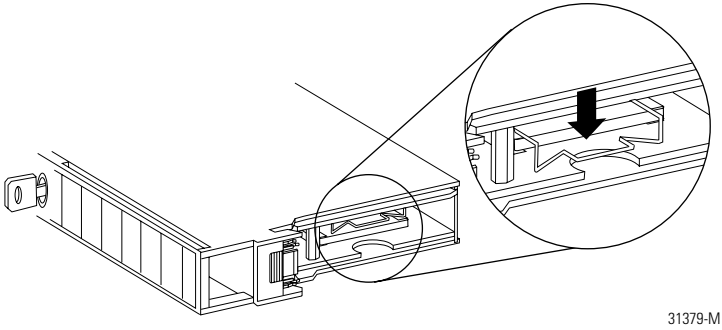
31377-M



31378-M

3. Insert the 1784-CF64 Industrial CompactFlash card into the socket at the bottom of the controller.

4. Pull the clip forward and then downward until it snaps into place over the card.



31379-M

Connect a Battery

WARNING

When you connect or disconnect the battery an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

For Safety information on the handling of lithium batteries, including handling and disposal of leaking batteries, see Guidelines for Handling Lithium Batteries, publication AG 5-4.

ATTENTION

Connect only a 1756-BA1 battery or a 1756-BATM battery module to the controller. If you connect a different battery, you may damage the controller.

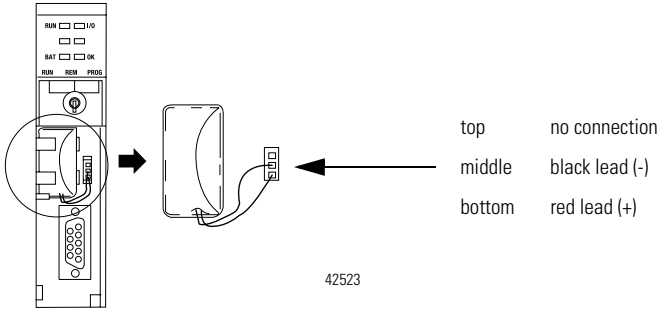
To maintain the memory of the controller while the controller is without power, either use nonvolatile memory or connect a battery:

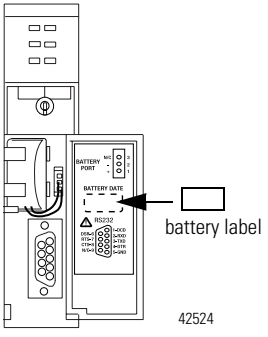
If your controller:	And you want to:	Then:
has nonvolatile memory	→	A battery is permitted but *not* required.
does not have nonvolatile memory	maintain memory *only while the controller is in the chassis*	Connect a 1756-BA1 battery or a 1756-BATM battery module.
	maintain memory while the controller is *out of the chassis*	Connect a 1756-BA1 battery.

To connect a 1756-BATM battery module, see the *ControlLogix Battery Module Installation Instructions,* publication 1756-IN576.

To connect a 1756-BA1 battery:

1. Install a 1756-BA1 battery.





2. Write on the battery label the date you install the battery.

3. Attach the label to the inside of the controller door.

ATTENTION

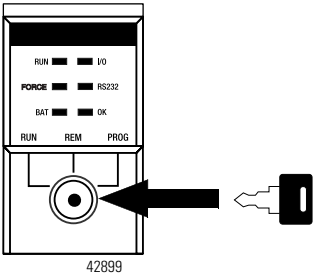
To prevent possible battery leakage, even if the BAT LED is off, replace a 1756-BA1 battery according to the following schedule:

If the temperature 1 in. below the chassis is:	Replace the battery within:
0° to 35° C	No replacement is required until the BAT LED turns on.
36° to 40° C	3 years
41° to 45° C	2 years
46° to 50° C	16 months
51° to 55° C	11 months
56° to 60° C	8 months

ATTENTION

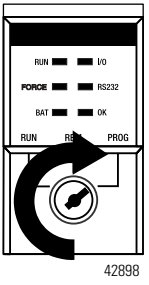
Store batteries in a cool, dry environment. We recommend 25°C with 40% to 60% relative humidity. You may store batteries for up to 30 days between -45° to 85°C, such as during transportation. To avoid possible leakage, *do not* store batteries above 60°C for more than 30 days.

Turn the Keyswitch to the PROG Position



1. Insert the key into the controller.

2. Turn the key to the PROG position.



Install the Controller into the Chassis

When you install a ControlLogix combo module, you can:

- place the controller in any slot
- use multiple controllers in the same chassis

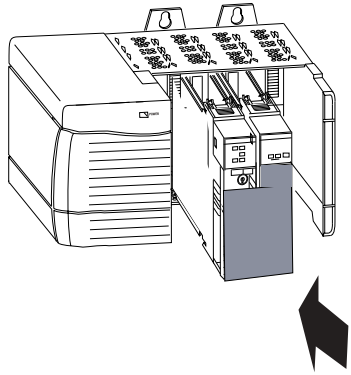
You can install or remove a ControlLogix controller while chassis power is on and the system is operating.

WARNING

When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

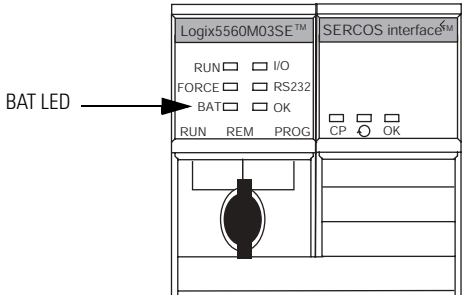
1. Align the circuit board with the top and bottom guides in the chassis.



2. Slide the module into the chassis. The controller is fully installed when it is flush with the power supply or other installed modules and the top and bottom latches are engaged.

Check the BAT LED

1. Turn on the chassis power.



2. Is the BAT LED off?

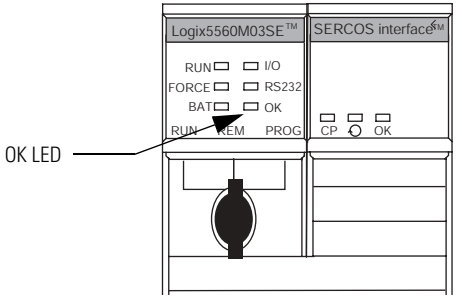
If:	Then:
Yes	Go to "Check the OK LED of the Controller" on page 16.
No	Go to step 3.

3. Check that the battery or battery module is correctly connected to the controller.

4. If the BAT LED remains on, install another battery.

5. If the BAT LED remains on after you complete step 4, contact your Rockwell Automation representative or local distributor.

Check the OK LED of the Controller



What color is the OK LED?

If:	Then:	Actions:
solid green	The controller is OK and its firmware has been updated.	No further actions are required. However, the revision of firmware must be compatible with your revision of RSLogix 5000 software.
flashing red	The controller is OK but it requires a firmware update.	Go to "Install a Firmware Upgrade Kit" on page 17.
solid red	The controller is *not* operational.	Contact your Rockwell Automation representative or local distributor.

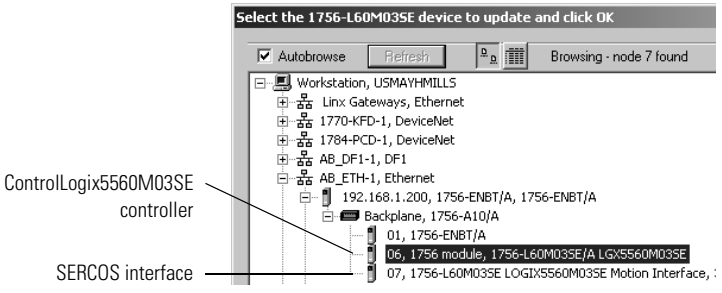
Install a Firmware Upgrade Kit

To update the firmware of the controller, first install a firmware upgrade kit.

For this controller	Use this revision:
1756-L60M03SE	13.x or later

- The upgrade kit includes the firmware for *both* the controller and its SERCOS interface.
- Make sure that the firmware revision is compatible with your revision of RSLogix 5000 software.
- An upgrade kit ships on a supplemental CD along with RSLogix 5000 software.
- To download an upgrade kit, go to www.ab.com. Choose *Product Support*. Choose *Firmware Updates*.

In RSLinx software, the controller shows up as 2 devices.



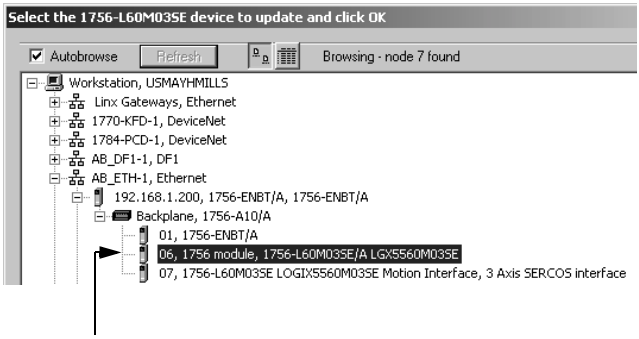
You update *only* the left-hand slot (controller). The update *automatically* includes *both* the controller (left-hand slot) and its SERCOS interface (right-hand slot).

Update the Controller

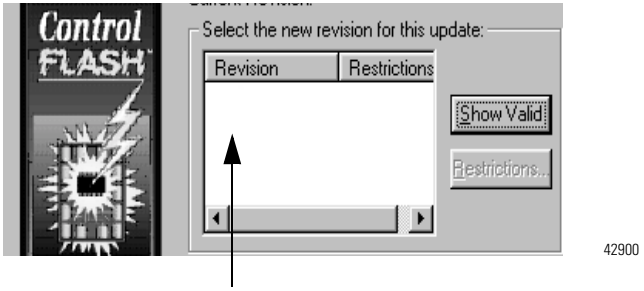
TIP RSLogix 5000 software, revision 10.0 or later, lets you update the firmware of a controller as part of the download sequence. To update the controller, download your project and follow the prompts of the software.

1. Connect the controller or chassis to the same network as your workstation.
2. Start ControlFLASH software.
3. Choose *Next* >.
4. Select the catalog number 1756-L60M03SE and choose *Next* >.
5. Expand the network until you see the controller.

IMPORTANT If the required network is not shown, first configure a driver for the network in RSLinx software.



6. Select the controller (left-hand slot) and choose *OK*.

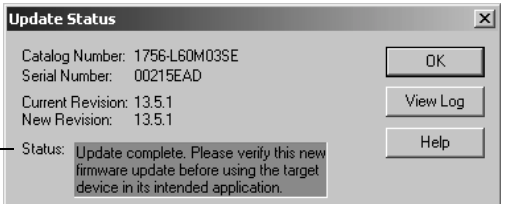


7. Select the revision level to which you want to update the controller and choose *Next* >.

8. To start the update of the controller, choose *Finish* and then *Yes*.

- The update process automatically updates *both* the controller and its SERCOS interface.
- Make sure you wait until both slots are updated.

After the controller and SERCOS interface are updated, the status box displays *Update complete.*


Update Status
Catalog Number: 1756-L60M03SE
Serial Number: 00215EAD
Current Revision: 13.5.1
New Revision: 13.5.1
Status: Update complete. Please verify this new firmware update before using the target device in its intended application.
OK
View Log
Help

9. Choose *OK*.

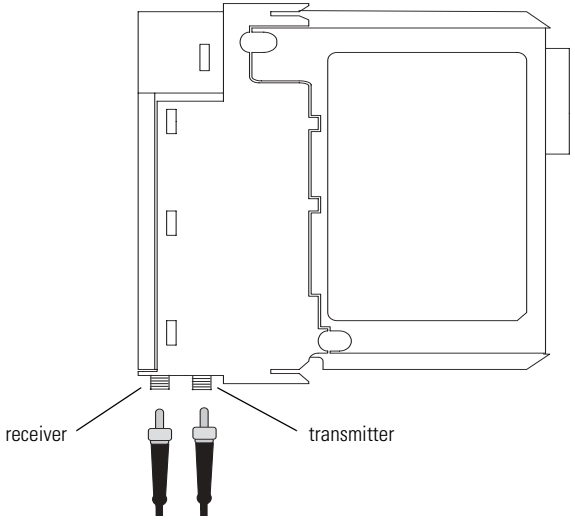
10. To close ControlFLASH software, choose *Cancel* and then *Yes*.

Connect the Fiber Optic Cables

ATTENTION

Under certain conditions, viewing the optical port may expose the eye to hazard. When viewed under some conditions, the optical port may expose the eye beyond the maximum permissible exposure recommended in ANSI Z136.2, 1993.

Under most viewing conditions, there is no eye hazard. The fiber optics used with the SERCOS interface is rated Class 1 for IEC LED Safety Classification.



1. Remove the protective end caps from the receiver and transmitter of the SERCOS interface.

2. Insert each fiber optic cable into the appropriate connector and screw on finger tight. The cable that emits light is the transmitter.

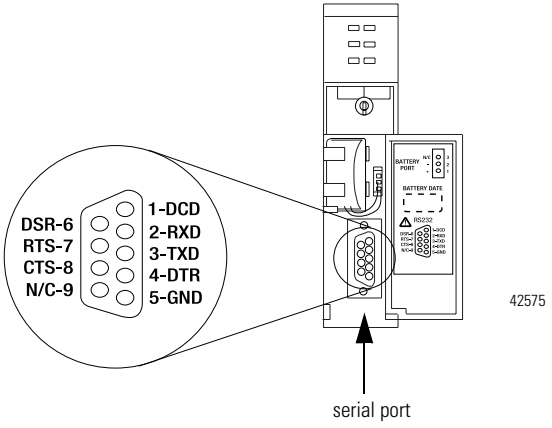
Connect a Serial Cable

WARNING

If you connect or disconnect the serial cable with power applied to this module or the serial device on the other end of the cable, an electrical arc can occur. This could cause an explosion in hazardous location installations.

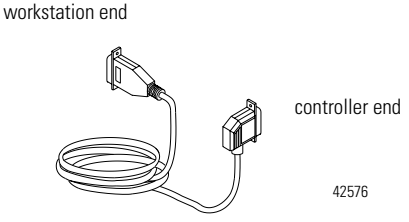
Make sure that power is removed or the area is nonhazardous before proceeding.

Use the serial port for RS-232 communication.



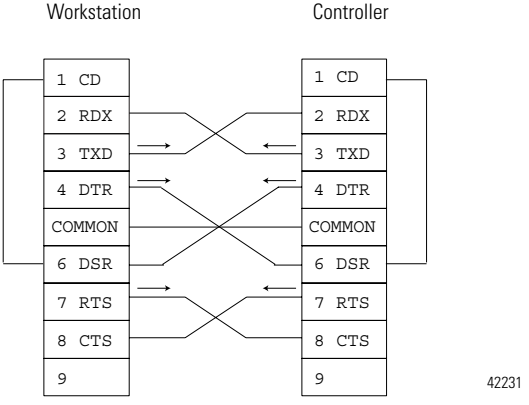
To connect a workstation to the serial port, use one of these cables:

- 1756-CP3 serial cable
- 1747-CP3 cable from the SLC product family (If you use this cable, the controller door may not close.)



If you make your own serial cable:

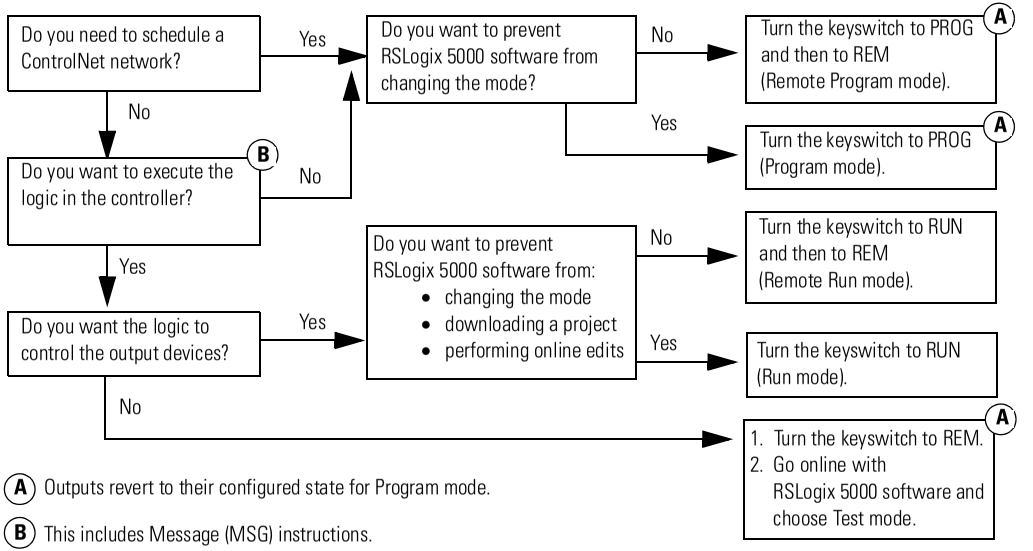
- Limit the length to 15.2m (50 ft).
- Wire the connectors as follows:



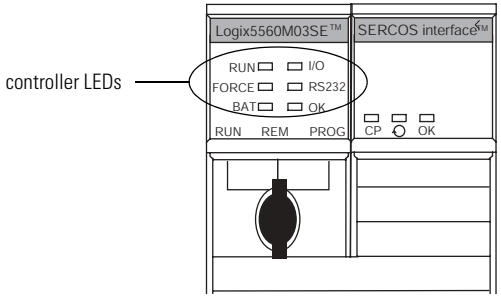
- Attach the shield to both connectors

Choose the Operating Mode of the Controller

Important
- All modes send and receive data in response to a message from another controller.
- All modes produce and consume tags.


Do you need to schedule a ControlNet network?
Yes
No
Do you want to prevent RSLogix 5000 software from changing the mode?
No
Yes
Turn the keyswitch to PROG and then to REM (Remote Program mode).
A
Turn the keyswitch to PROG (Program mode).
A
Do you want to execute the logic in the controller?
B
No
Yes
Do you want to prevent RSLogix 5000 software from:
• changing the mode
• downloading a project
• performing online edits
No
Yes
Turn the keyswitch to RUN and then to REM (Remote Run mode).
Turn the keyswitch to RUN (Run mode).
Do you want the logic to control the output devices?
Yes
No
1. Turn the keyswitch to REM.
2. Go online with RSLogix 5000 software and choose Test mode.
A
A Outputs revert to their configured state for Program mode.
B This includes Message (MSG) instructions.

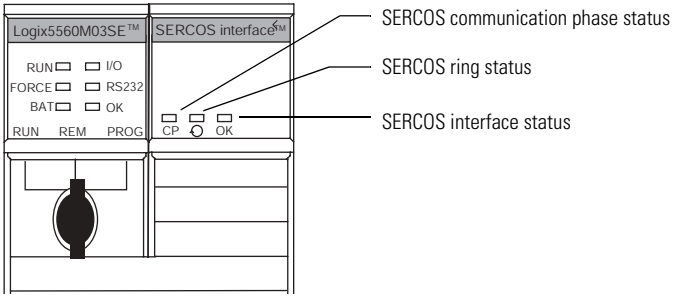
Interpret Controller LEDs



Indicator	Color	Description
RUN	Off	Controller is in Program or Test mode.
	Solid Green	Controller is in RUN mode.
I/O	Off	Either: • There are *no* devices in the I/O configuration of the controller. • The controller does *not* contain a project.
	Solid Green	Controller is communicating with all of the devices in its I/O configuration.
	Flashing Green	One or more devices in the I/O configuration of the controller are not responding.
	Flashing Red	The chassis is bad. Replace the chassis.
Force	Off	• No tags contain I/O force values • I/O forces are inactive (disabled).
	Solid Amber	• I/O forces are active (enabled). • I/O force values may or may not exist.
	Flashing Amber	One or more input or output addresses have been forced to an On or Off state, but the forces have not been enabled.

Indicator	Color	Description
RS232	Off	There is no activity.
	Solid Green	Data is being received or transmitted.
BAT	Off	The battery supports memory.
	Solid Red	Either the battery is not installed or it is 95% discharged and should be replaced.
OK	Off	No power is applied.
	Flashing Red	If controller is new, then it requires a firmware update. If controller is *not* new, then a major fault has occurred. To clear the fault either: • Turn the keyswitch to PROG then to RUN then to PROG. • Go online with RSLogix 5000 software. You *may* also have to download the project to the controller.
	Solid Red	The controller detected a non-recoverable fault, so it cleared the project from memory. To recover: 1. Cycle power to the chassis. 2. Download the project. 3. Change to RUN mode. If the OK LED remains solid red, contact your Rockwell Automation representative or local distributor.
	Solid Green	The controller is OK.
	Flashing Green	The controller is storing or loading a project to or from nonvolatile memory.

Interpret the SERCOS interface LEDs



Interpret SERCOS Interface Status Using the OK Indicator

If the OK LED displays:	Then the module status is:	Take this action:
Off	The module is not operating.	• Apply chassis power. • Verify the module is completely inserted into the chassis and backplane.
Flashing green	The module has passed internal diagnostics, but has not established active communications.	None, if you have not configured the module.
Solid green	• Data is being exchanged. • The module is in the normal operating state.	None. The module is ready for action.
Flashing red	• A major recoverable failure has occurred. • An NVS update is in progress.	If an NVS update is in progress, complete the NVS update. If an NVS update is not in progress: Reboot
Solid red	A potential nonrecoverable fault has occurred.	• Reboot the module. • If the solid red persists, replace the module.

Interpret SERCOS Ring Status

If the SERCOS Ring LED displays:	Then the ring status is:	Take this action:
Solid green	The ring, drive, and axes are configured and are actively communicating through to the nodes on the ring.	None.
Flashing red	The module has detected a setup or configuration fault with the ring.	Check your system setup and configuration as follows:. • Ensure drive and axes addresses are correct. • Remove excess axes from ring. • Make sure application program has selected the proper Ring Cycle Period and Baud Rate.
Solid red	The module has detected a hardware or installation fault with the ring.	Check your system hardware and installation as follows: • Make sure all cables are properly installed. • Make sure cable is of the correct type and length. • Make sure application program has configured the module's ring transmit level to High when using specified cables. • Make sure the drive's transmit levels are set appropriately. • Inspect cables for degradation. • Inspect drives for any faults and correct them.

If the SERCOS Ring LED displays:	Then the ring status is:	Take this action:
Off	The module has detected no ring data on its receiver or has not successfully completed phase 2.	Check your system and installation as follows: • Make sure all cables are properly installed • Inspect cable for degradation and breakage. • Inspect drives for faults.
Flashing green	The ring, drive, or axes are not configured but, at least one has been identified.	Not a problem if the system has not been configured. If you are having trouble configuring the ring, drive, and axes: Make sure that the application program is setup properly for the equipment in use.

Interpret SERCOS Communication Phase Status Using the CP Indicator

If the CP LED displays:	Then the status is:
Solid Orange	In Phase -1: Autobaud detection in progress.
OFF	In Phase 0: looking for a closed ring.
Flashing Red	In Phase 1: looking for active nodes.
Alternating Red/Green	In Phase 2: configuring nodes for communication.
Flashing Green	In Phase 3: configuring device specific parameters
Solid Green	In Phase 4: configured and active.

Remove the Controller from the Chassis, If Required

You can install or remove a ControlLogix controller while chassis power is on and the system is operating. If you remove the controller, all the devices owned by the controller go to their configured fault state.

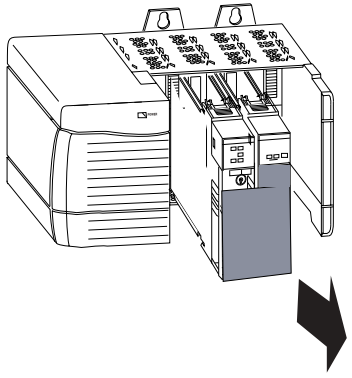
WARNING

When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

1. On the top and bottom of the controller, press the locking tabs.

2. Slide the controller out of the chassis.



Fiber Optic Transmission

The fiber optic transmitter for the SERCOS interface 3 Axis module uses a 650nm wavelength. This produces a visible light from the port and is a determinant in factoring maximum cable lengths. The high light output lets you use both plastic optical fiber (POF) and Hard Clad Silica (HCS®) cables.

Fiber Optic Cables

The SERCOS interface is connected to the drive(s) via a fiber optic cable. These cables can be either made of plastic or glass. For more information about the care, handling, and installation of fiber optic cables see the *Fiber Optic Cable Installation and Handling Instructions*, publication number 2090-IN010x-EN-P.

Plastic Fiber Optic Cables

The modules are connected to the drive(s) via a 1000µm plastic simplex fiber optical cable. Plastic fiber optic cables have a transmission range of 1 meter to 32 meters. Both the transmitter and receiver connections are made using a F-SMA standard plug that conforms to the F-SMA screw type connector.

Pre-made plastic fiber optic cable assemblies are available from Rockwell Automation. Plastic fiber optic cables come in a variety of jackets depending on application environments. The cable is available without a jacket (Chlorinated Polyethylene) for use inside an electrical cabinet, a standard jacket (Polyvinyl Chloride) for use outside of electrical cabinets, and a nylon jacket for use in harsh environments.

The following table shows the catalog numbers and available lengths for plastic fiber optic cables that are not jacketed (Chlorinated Polyethylene) and should be used only within an electrical cabinet.

Allen-Bradley Catalog Number	Length in meters (inches)
2090-SCEP0-1	0.1 m, (4 in)
2090-SCEP0-3	0.3 m, (12 in)
2090-SCEP0-9	0.9 m, (35 in)
2090-SCEP1-0	1 m (39 in)
2090-SCEP3-0	3 m (118 in)
2090-SCEP5-0	5 m (197 in)
2090-SCEP8-0	8 m (315 in)
2090-SCEP10-0	10 m (394 in)
2090-SCEP15-0	15 m (591 in)
2090-SCEP20-0	20 m (787 in)
2090-SCEP25-0	25 m (984 in)
2090-SCEP32-0	32 m (1260 in)

The plastic fiber optic cables listed in the following table have a standard jacket (Polyvinyl Chloride) for use in normal environments outside of an electrical cabinet.

Allen-Bradley Catalog Number	Length in meters (inches)
2090-SCVP0-1	0.1 m, (4 in)
2090-SCVP0-3	0.3 m, (12 in)
2090-SCVP0-9	0.9 m, (35 in)
2090-SCVP1-0	1 m (39 in)
2090-SCVP3-0	3 m (118 in
2090-SCVP5-0	5 m (197 in)
2090-SCVP8-0	8 m (315 in)

Allen-Bradley Catalog Number	Length in meters (inches)
2090-SCVP10-0	10 m (394 in)
2090-SCVP15-0	15 m (591 in)
2090-SCVP20-0	20 m (787in)
2090-SCVP25-0	25 m (984 in)
2090-SCVP32-0	32 m (1260 in)

If your cables are going to run through a harsh environment, the cable should be appropriately jacketed. The following table contains the catalog numbers and lengths for nylon jacketed cables for use in harsh environments.

Allen-Bradley Catalog Number	Length in meters (inches)
2090-SCNP0-1	0.1 m, (4 in)
2090-SCNP0-3	0.3 m, (12 in)
2090-SCNP0-9	0.9 m, (35 in)
2090-SCNP1-0	1 m, (39 in)
2090-SCNP3-0	3 m, (118 in)
2090-SCNP5-0	5 m (197 in)
2090-SCNP8-0	8 m (315 in)
2090-SCNP10-0	10 m (394 in)
2090-SCNP15-0	15 m (591 in)
2090-SCNP20-0	20 m (787 in)
2090-SCNP25-0	25 m (984 in)
2090-SCNP32-0	32 m (1260 in)

Glass Fiber Optic Cables

Fiber Optic cables made from glass are a better conduit for the light to pass through thus increasing the length of cable that may be used and still supply a strong enough signal for use with the SERCOS interface.

The modules are connected to the drive(s) via a 200µm glass fiber optical cable. Glass fiber optic cables have a transmission range of 1 meter to 200 meters. Both the transmitter and receiver connections are made using a F-SMA standard plug that conforms to the F-SMA screw type connector.

Pre-made glass fiber optic cable assemblies are available from Rockwell Automation. Glass fiber optic cables come with a standard jacket (Polyvinyl Chloride) for use in normal environments.

The following table shows the catalog numbers and lengths available for pre-made glass fiber optic cables. These cables have a standard jacket (Polyvinyl Chloride) for use in normal environments.

Allen-Bradley Catalog Number	Length in meters (inches)
2090-SCVG1-0	1 m (39 in)
2090-SCVG3-0	3 m (118 in)
2090-SCVG5-0	5 m (197 in)
2090-SCVG8-0	8 m (315 in)
2090-SCVG10-0	10 m (394 in)
2090-SCVG15-0	15 m (591 in)
2090-SCVG20-0	20 m (787 in)
2090-SCVG25-0	25 m (984 in)
2090-SCVG32-0	32 m (1260 in)
2090-SCVG50-0	50m (1970 in)
2090-SCVG100-0	100m (3937 in)

Cable Connector Handling and Maintenance

When cables are not in use, keep the ends covered with the dust covers that came with the cables. This helps to keep dust and small particles from blocking the optic path. Good system performance is dependent on clean port optics and cable ferrules to avoid obstructing the optical path. Clean compressed air is often sufficient to remove particles of dirt.

ATTENTION

The small junction size inherent in the design of these components increases the components' susceptibility to damage from electrostatic discharge (ESD). It is advised that normal static precautions be taken in handling and assembly of these components to prevent damage and/or degradation which can be induced by ESD.

Supported Drives

The following Allen-Bradley drives are supported by the SERCOS interface motion modules.

Catalog Number	Description
1394-SJT05-D	1394 5kW SERCOS Interface 460V drive
1394-SJT10-D	1394 10kW SERCOS Interface 460V drive
1394-SJT22-D	1394 22kW SERCOS Interface 460V drive
2094-AC05-M01	Kinetix 6000™ 230VAC ,IAM, 3kW PS, 9A Cont, 17A Peak
2094-AC05-MP5	Kinetix 6000, 230VAC ,IAM, 3kW PS, 5A Cont, 10A Peak
2094-AC09-M02	Kinetix 6000, 230VAC ,IAM, 6kW PS, 15A Cont, 30A Peak
2094-AC16-M03	Kinetix 6000, 230VAC ,IAM, 15kW PS, 24A Cont, 49A Peak
2094-AC32-M05	Kinetix 6000, 230VAC ,IAM, 23kW PS, 49A Cont, 98A Peak
2094-AM01	Kinetix 6000, 230VAC ,AM, 9A Cont, 17A Peak

Catalog Number	Description
2094-AM02	Kinetix 6000, 230VAC ,AM, 15A Cont, 30A Peak
2094-AM03	Kinetix 6000, 230VAC ,AM, 24A Cont, 49A Peak
2094-AM05	Kinetix 6000, 230VAC ,AM, 49A Cont, 98A Peak
2094-AMP5	Kinetix 6000, 230VAC ,AM, 5A Cont, 10A Peak
2094-BC01-M01	Kinetix 6000, 460VAC, IAM, 6kW PS, 9A Cont, 13A Peak
2094-BC01-MP5	Kinetix 6000, 460VAC, IAM, 6kW PS, 4A Cont, 6A Peak
2094-BC02-M02	Kinetix 6000, 460VAC, IAM, 15kW PS, 15A Cont, 22A Peak
2094-BC04-M03	Kinetix 6000, 460VAC, IAM, 30kW PS, 30A Cont, 45A Peak
2094-BC07-M05	Kinetix 6000, 460VAC, IAM, 45kW PS, 49A Cont, 73A Peak
2094-BM01	Kinetix 6000, 460VAC, AM, 9A Cont, 13A Peak
2094-BM02	Kinetix 6000, 460VAC, AM, 15A Cont, 22A Peak
2094-BM03	Kinetix 6000, 460VAC, AM, 30A Cont, 45A Peak
2094-BM05	Kinetix 6000, 460VAC, AM, 49A Cont, 79A Peak
2094-BMP5	Kinetix 6000, 460VAC, AM, 4A Cont, 6A Peak
2098-DSD-005-SE	Ultra3000™ 0.5kW SERCOS Interface 230VDrive
2098-DSD-010-SE	Ultra30001kW SERCOS Interface 230VDrive
2098-DSD-020-SE	Ultra3000 2kW SERCOS Interface 230VDrive
2098-DSD-030-SE	Ultra3000 3kW SERCOS Interface 230VDrive
2098-DSD-075-SE	Ultra3000 7.5kW SERCOS Interface 230VDrive
2098-DSD-150-SE	Ultra3000 15kW SERCOS Interface 230VDrive
2098-DSD-HV030-SE	Ultra3000 3kW, 460VAC SERCOS Interface 460V drive
2098-DSD-HV050-SE	Ultra3000 5kW, 460VAC SERCOS Interface 460V drive
2098-DSD-HV100-SE	Ultra3000 10kW, 460VAC SERCOS Interface 460V drive
2098-DSD-HV150-SE	Ultra3000 15kW, 460VAC SERCOS Interface 460V drive
2098-DSD-HV220-SE	Ultra3000 22kW, 460VAC SERCOS Interface 460V drive
8720MC-B014	8720MC, 460VAC/750VDC, SERCOS Drive, 14A Cont, 21A Peak

Catalog Number	Description
8720MC-B021	8720MC, 460VAC/750VDC, SERCOS Drive, 21A Cont, 32A Peak
8720MC-B027	8720MC, 460VAC/750VDC, SERCOS Drive, 27A Cont, 41A Peak
8720MC-B034	8720MC, 460VAC/750VDC, SERCOS Drive, 34A Cont, 51A Peak
8720MC-B042	8720MC, 460VAC/750VDC, SERCOS Drive, 42A Cont, 63A Peak
8720MC-B048	8720MC, 460VAC/750VDC, SERCOS Drive, 48A Cont, 72A Peak
8720MC-D065	8720MC, 750VDC, SERCOS Drive, 65A Cont, 98A Peak
8720MC-D078	8720MC, 750VDC, SERCOS Drive, 78A Cont, 117A Peak
8720MC-D097	8720MC, 750VDC, SERCOS Drive, 97A Cont, 145A Peak
8720MC-D120	8720MC, 750VDC, SERCOS Drive, 120A Cont, 180A Peak
8720MC-D149	8720MC, 750VDC, SERCOS Drive, 149A Cont, 224A Peak
8720MC-D0180	8720MC, 750VDC, SERCOS Drive, 180A Cont, 270A Peak

Ring Topology

The SERCOS network consists of a Master SERCOS interface and multiple drives connected in a ring topology.

ATTENTION

Each drive on the SERCOS ring must have a unique SERCOS address. If two axes have the same address on the same ring, both respond to commanded motion. This could lead to damage to the equipment or product and could result in personal injury.

The fiber optical ring starts and ends with the master.

The following diagram gives an example of a possible network connected in a ring topology.

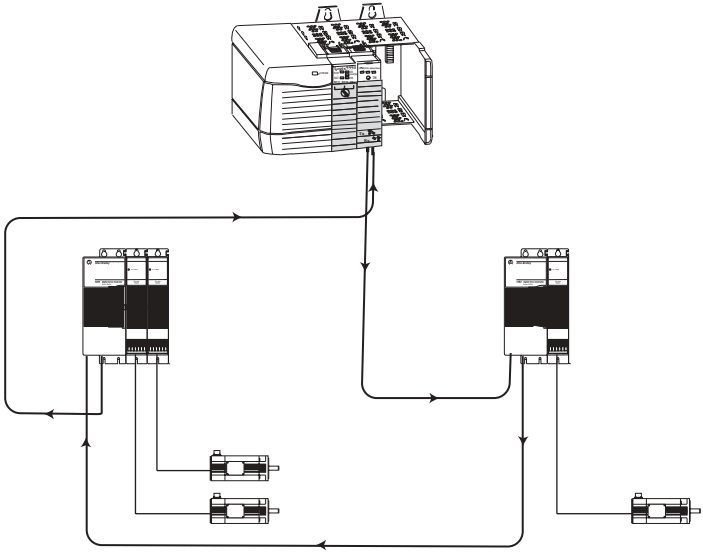


Figure 1 Ring topology with 1394C-SJT*xx*-D

Any break in the fiber optical ring disables the SERCOS network and creates a warning that is identified by the SERCOS Ring Status LED.

Specifications – 1756-L60M03SE Controller

The following specifications apply to the 1756-L60M03SE controller:

Description:	Value:	
Memory	Data and Logic[1]	750K bytes
	I/O[2]	478K bytes
	Nonvolatile[3]	Yes
Backplane Current	@5.1V dc	1.3A
	@24V dc	6mA
Power Dissipation	3.5W	
Thermal Dissipation	11.9 BTU/hr	
Weight	0.52 kg (18.34 oz).	
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): • 0° to 60° C (32 to 140° F)	
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), IEC 60068-2-14 (Test Na, Un-packaged Non-operating Thermal Shock): • -40° to 85° C (-40 to 185° F)	
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): • 5% to 95% noncondensing	
Vibration	IEC60068-2-6 (Test Fc, Operating): • 2g @ 10-500Hz	
Operating Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): • 30g	
Non-Operating Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): • 50g	
Emissions	CISPR 11: • Group 1, Class A	

Description:	**Value:**	
ESD Immunity	IEC 61000-4-2: • 4kV contact discharges • 8kV air discharges	
Radiated RF Immunity	IEC 61000-4-3: • 10V/m with 1kHz sine-wave 80%AM from 80MHz to 2000MHz • 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz • 10V/m with 200Hz 50% Pulse 100%AM at 1890Mhz	
EFT/B immunity	IEC 61000-4-4: • ±4kV at 2.5kHz on communications ports	
Surge Transient Immunity	IEC 61000-4-5: • ±2kV line-earth(CM) on communications ports	
Conducted RF Immunity	IEC 61000-4-6: • 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz	
Enclosure Type Rating	none (open-style)	
Isolation Voltage	50V continuous Tested to withstand 707V dc for 60 seconds	
Wiring Category[4]	2 - on communications ports	
Programming Cable	1756-CP3 or 1747-CP3 serial cable category 3[4]	
Replacement Battery	**For this component:**	**Use this battery:**
	1756-L60M03SE controller	1756-BA1 (0.59g lithium)
	1756-BATM battery module	1756-BATA (10g lithium)
Number of Drives	• up to 3 SERCOS interface drives via the integral SERCOS interface of the controller • up to 3 *additional* SERCOS interface drives or analog drives by adding modules to the chassis:	

Description:	**Value:**	
SERCOS interface	SERCOS Class	Class B (Position or Velocity)
	Data Rate	4 Mbits or 8 Mbits per second
	Operating Cycle @ 4 Mb	0.5 ms for up to 2 axes 1 ms for up to 3 axes 2 ms for up to 3 axes
	Operating Cycle @ 8 Mb	0.5 ms for up to 3 axes 1 ms for up to 3 axes
Plastic Fiber Optic Cable	Transmission Range	1-32 meters
	Core Diameter	980µm ± 60µm
	Cladding Diameter	1000µm ± 60µm
	Cable Attenuation	140 dB/km @ 650nm
	Operating Temperature	-55 to 85° C
	Connector	F-SMA standard screw-type connector
	Bend Radius	2.5 cm
Glass Fiber Optic Cable	Transmission Range	1-200 meters
	Core Diameter	200µm ± 4µm
	Cladding Diameter	230µm +0/–10µm
	Cable Attenuation	6.0 dB/km @ 820nm
	Operating Temperature	-20 to 85° C
	Connector	F-SMA standard screw-type connector
	Bend Radius	2.5 cm

(1) Data and Logic memory stores: tags other than I/O, produced, or consumed tags; logic routines; and communication with OPC/DDE tags that use RSLinx software.

(2) I/O memory stores: I/O tags, produced tags, consumed tags, communication via Message (MSG) instructions, communication with workstations, and communication with OPC/DDE tags that use RSLinx software.

(3) Requires a 1784-CF64 Industrial CompactFlash card.

(4) Use this Conductor Category information for planning conductor routing. Refer to Publication 1770-4.1, “Industrial Automation Wiring and Grounding Guidelines”.

Certifications – 1756-L60M03SE Controller

When marked, the 1756-L60M03SE controller have the following certifications. See the Product Certification link at www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Certification:	Description
UL	UL Listed Industrial Control Equipment
CSA	CSA Certified Process Control Equipment
CSA	CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations
CE	European Union 89/336/EEC EMC Directive, compliant with: • EN 50082-2; Industrial Immunity • EN 61326; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

Specifications and Certifications - 1784-CF64 Industrial CompactFlash Card

For CE and C-Tick, see the Product Certification link at www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Description:	Value:
User Available Memory	64M bytes
Nonvolatile Memory	Yes
Weight	14.2 g (0.5 oz).
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): • 0 to 60°C (32 to 140°F)

Description:	**Value:**	
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), IEC 60068-2-14 (Test Na, Un-packaged Non-operating Thermal Shock): • -40 to 85°C (-40 to 185°F)	
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): • 5% to 95% noncondensing	
Vibration	IEC60068-2-6 (Test Fc, Operating): • 2g @ 10-500Hz	
Operating Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): • 30g	
Non-Operating Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): • 50g	
ESD Immunity	IEC 61000-4-2: • 4kV contact discharges • 8kV air discharges	
Radiated RF Immunity	IEC 61000-4-3: • 10V/m with 1kHz sine-wave 80%AM from 80MHz to 1000MHz	
EFT/B immunity	IEC 61000-4-4: • ±4kV at 2.5kHz on power ports	
Conducted RF Immunity	IEC 61000-4-6: • 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz	
Enclosure Type Rating	none (open-style)	
Emissions	CISPR 11: • Group 1, Class A	
Certifications: (when product is marked)	CE	European Union 89/336/EEC EMC Directive, compliant with: • EN61000-6-4; Industrial Emissions • EN 50082-2; Industrial Immunity • EN 61326; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity
	C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

Environment and Enclosure Information

ATTENTION

Environment and Enclosure

This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as “open type” equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

NOTE: See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the Allen-Bradley publication 1770-4.1 (“Industrial Automation Wiring and Grounding Guidelines”), for additional installation requirements pertaining to this equipment.

North American Hazardous Location Approval

The following information applies when operating this equipment in hazardous locations:	**Informations sur l'utilisation de cet équipement en environnements dangereux :**
Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation.	Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.

WARNING

EXPLOSION HAZARD

- Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.
- Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product.
- Substitution of components may impair suitability for Class I, Division 2.
- If this product contains batteries, they must only be changed in an area known to be nonhazardous.

AVERTISSEMENT

RISQUE D'EXPLOSION

- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement.
- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit.
- La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2.
- S'assurer que l'environnement est classé non dangereux avant de changer les piles.

SERCOS interface is a trademark of the Interests Group SERCOS interface e.V. of Stuttgart, Germany. Rockwell Automation is a member of the SERCOS NA.

This product may contain licensed technology which is the subject of one or more of the following Microsoft Corporation patents:

- US Patent No. 5,579,517
- US Patent No. 5,745,902
- US Patent No. 5,758,352
- US Patent No. 6,286,013
- DE Patent No. 618540
- FR Patent No. 615840
- GB Patent No. 615840

Rockwell Automation Support

Rockwell Automation provides technical information on the web to assist you in using our products. At http://support.rockwellautomation.com, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of our products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned:

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

www.rockwellautomation.com

Corporate Headquarters
Rockwell Automation, 777 East Wisconsin Avenue, Suite 1400, Milwaukee, WI, 53202-5302 USA, Tel: (1) 414.212.5200, Fax: (1) 414.212.5201

Headquarters for Allen-Bradley Products, Rockwell Software Products and Global Manufacturing Solutions
Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe: Rockwell Automation SA/NV, Vorstlaan/Boulevard du Souverain 36-BP 3A/B, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Headquarters for Dodge and Reliance Electric Products
Americas: Rockwell Automation, 6040 Ponders Court, Greenville, SC 29615-4617 USA, Tel: (1) 864.297.4800, Fax: (1) 864.281.2433
Europe: Rockwell Automation, Brühlstraße 22, D-74834 Elztal-Dallau, Germany, Tel: (49) 6261 9410, Fax: (49) 6261 17741
Asia Pacific: Rockwell Automation, 55 Newton Road, #11-01/02 Revenue House, Singapore 307987, Tel: (65) 351 6723, Fax: (65) 355 1733

Publication 1756-IN593A-EN-P – June 2004 PN 957859-88

Copyright © 2004 Rockwell Automation, Inc. All rights reserved. Printed in the U.S.A.